



MOHAWK
INDUSTRIAL LABORATORIES INC.

For Local Release

DELIVERIES ACCELERATING FOR
MIL AUTOMATED INFORMATION RETRIEVAL
SYSTEM 4000

Vernon, N.Y. - William W. Abraham, President of Mohawk Industrial Laboratories, Inc., says "Shipment of our System 4000 units began in October, 1970, following the successful completion of extensive field tests. Since then the delivery rate has steadily increased and we already have a gratifying total of installations."

"On one of the field tests, by a large leading manufacturer, a branch office established a service dispatching system using the System 4000. The user reported significant cost reduction and substantial improvement in customer service."

The System 4000 will be exhibited at both the Spring Joint Computer Conference, May 18-20, at the Convention Hall in Atlantic City, N.J., and the National Microfilm Association Conference beginning May 25 in Washington, D. C.

The System 4000 permits fast, sophisticated cross-reference selection of information stored in unlimited quantities on tab card-size, randomly filed documents. One document or a group of documents can be retrieved in six seconds. The random filing feature reduces refiling time, eliminates filing errors. Anyone can operate the System.

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MOMAWK

System 4000 enables the user to have inquiry/response processing of randomly filed data without high-cost, complex equipment. The System effectively complements automatic typing operations (e.g. IBM's MC/ST) and mini-computer systems, by automating retrieval of magnetic cards and Hollerith-encoded tab cards. It also works well in a wide variety of microfilm storage applications, including COM. Jacketed microfilm, microfiche, and microfilm aperture cards are all accommodated.

Other System 4000 applications include order billing, inventory control, preventive maintenance, production control, personnel records, engineering drawings, and letters of credit.

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For Immediate Release

MIL Unveils the New, Solid State
System 4000

Vernon, New York - Mohawk Industrial Laboratories, Inc. will exhibit for the first time the new, solid state System 4000 automated information retrieval unit at both Spring Joint Computer Conference, May 18-20, Convention Hall, Atlantic City, N. J., and the National Microfilm Association Conference beginning May 25 in Washington, D. C.

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MIDHAWK

With the new, solid state System 4000 the user enjoys significantly improved performance and reliability. The modular design facilitates servicing since subassemblies are field replaceable. The functional concept and integrated circuitry (TTL MSI, DTL) allow easy system interface with computers and with peripherals such as strip printers, paper tape punches and remote information entry devices.

Fibre optics enhance the new System 4000's data input display feature. Greater illumination intensity and a wider viewing angle make it easier for the operator to sight verify data input.

System 4000 applications include order billing, inventory control, preventive maintenance, production control, personnel records, engineering drawings, and letters of credit. Initial deliveries of the solid state System 4000 have begun.



MOHAWK
INDUSTRIAL LABORATORIES INC.

MIL System 4000

APPLICATION BULLETIN

Computerized Order Billing

- The Problem: Alleviate Card Input Bottleneck
- The Solution: Use of MIL System 4000 to Automatically Retrieve Required Input
- Results:
- (1) Computer Equipment No Longer Idled by Lack of Input
 - (2) MIL System 4000 Pays for Itself in 10 months

APPLICATION BULLETIN

I. Organizational Overview

This MIL customer is a medium sized manufacturer of automotive lighting and safety products sold principally to original equipment manufacturers and to the automobile aftermarket. The large number of products and product variations - over 1,900 - complicates this manufacturer's order entry and order billing functions. The other significant factor is the daily requirement to process 300 orders, each averaging 6 line items. To cope with the large product and order volumes, the company has installed two card-oriented mini-computer systems to automate the order entry function and to produce the necessary input for their already-computerized order billing system.

II. File Processing Problems

With the two mini-computers, the order entry volume can be handled satisfactorily provided the required card input is available. Two types of cards constitute the input for order entry processing: (1) One customer card per order; (2) One product card for each item ordered (averages 6 per order). The mini-computers automatically print out customer and product information which has been keypunched into the tab cards. This significantly reduces the manual input required.

Prior to the installation of MIL's System 4000, the product and customer cards were retrieved from tub files by the operator and placed in the mini-computer's card reader. Following processing, these cards were mechanically sorted and then refiled by the operator. 300 Customer cards and 1,000 product cards were manually retrieved and refiled daily.

The basic problem with this manual file operation was that it could not provide the input cards, especially the product cards, fast enough. Even with a full time clerk retrieving product cards, it often happened that the mini-computers stood idle while the operators searched for the necessary input cards. Also, the operators and the clerk did not have time to refile used cards even though they were mechanically presorted. A serious out-of-file situation developed and necessitated making up to 15 duplicates of frequently used product cards just to be certain one would be available when needed as input. This, at best, was a partial solution since space requirements for the files became excessive.

III. System Requirements

Essentially, the new system had to alleviate the bottleneck in the automated order entry system caused by having to manually retrieve and refile large numbers of input cards daily. Specific objectives were to: (1) Speed up card retrieval to keep pace with the mini-computer

operation without adding personnel. (2) Eliminate the out-of-file situation without tying up costly office space.

IV. MIL System 4000 Solves The Problem

A. Systems Narrative

This customer decided to use MIL System 4000 to solve the main element of the problem: storage and retrieval of product cards for the 1500 most actively ordered products. A file of approximately 3500 product cards is stored in one System 4000 retriever. Duplicate cards for each product are in many cases still required since the two mini-computers run concurrently and since they now pull cards for several orders in advance. Frequently ordered products have up to 4 cards each, while inactive products have only one. The product cards are encoded and retrieved by product number.

Customer cards are still processed manually, which is practical since only one customer card file operation is required per order processed and since the operator has time to do this while the mini-computer is busy processing another order. One person operates System 4000 full time. The System 4000 operator receives the orders, retrieves the required product cards and passes the order and product cards to one of the mini-computer operators. The mini-computer operator manually retrieves the customer card and can now process the order. After the order processing is complete, the mini-computer operator manually refiles the customer card and returns the product cards to System 4000 where they are refiled randomly as a group in any retriever location. These cards are immediately available for re-use.

B. Principal System 4000 Benefits

1. The basic System 4000 benefit in this case is that the direct labor savings from automating the manual product card file operation more than offset the investment required for System 4000 hardware.
2. The customer now realizes the full potential from his investment in the mini-computer systems for order entry. Automating the product card file operation with System 4000 assures that the required input is available when needed.
3. System 4000 sufficiently increased the productivity of the existing staff to eliminate the need to add more people. Retrieval is faster with System 4000. Also, the random filing feature practically eliminates refiling time and ends misfiling problems. Being able to overlap System 4000 keyboard data entry and operation of the retriever especially speeds up retrieval time.

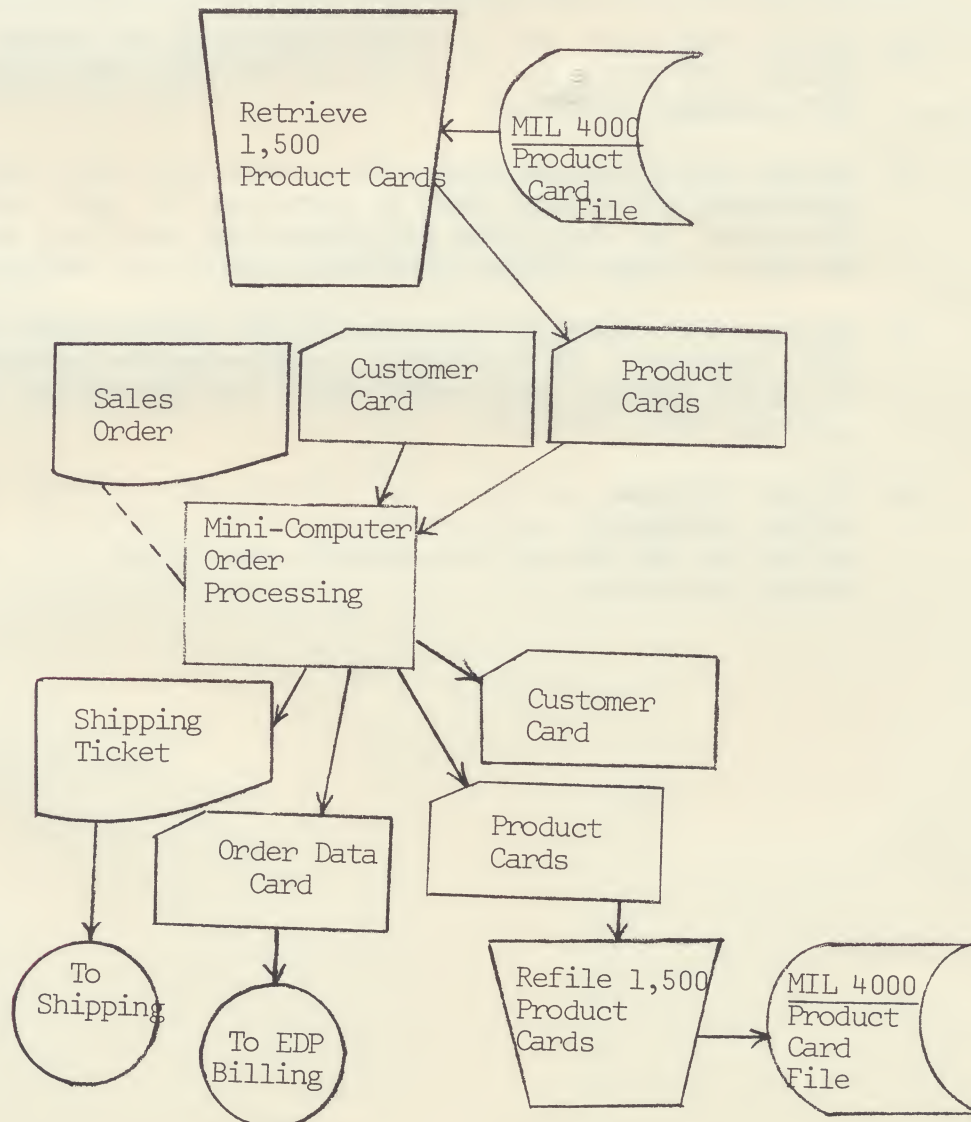
4. System 4000 made the mechanical sort operation (of used product cards) unnecessary.
5. The customer realized significant space savings. Excessive numbers of duplicate cards are no longer necessary to prevent a crippling out-of-file situation.

C. System 4000 Configuration

One basic System 4000

- 1 Retriever Unit (4000 card capacity)
- 1 Keyboard Control Unit
- 1 Punch Unit

D. Systems Flow Chart



E. File Processing Sequences

Product Number is the only sequence by which the product cards are retrieved. This customer's problem is handling a large volume file operation. No requirement exists for cross-referencing.

F. System 4000 Coding

Each product card is encoded with the customer's product number. This is a variable-length, alpha-numeric sequence requiring from 5-10 code fields. In all cases, System 4000 is cycled immediately following entry of the last character of the product code. In other words, unused code fields are not space-filled.

V. General Conclusions

System 4000 effectively complements data processing operations.

1. System 4000 stores and retrieves keypunched tab cards. The System 4000 coding in no way interferes with card reader or EAM equipment operation.
2. System 4000 automates manual file operations which hamper processing efficiency, such as searching for input cards or JCL cards. It could also facilitate such auxiliary operations as magnetic tape library inventory control and charge out.
3. System 4000's internal circuitry design permits easy interface with computers. As an example, a mini-computer programmed to handle complex input would output the appropriate code to a System 4000 retriever.
4. System 4000 also automates the storage and retrieval of magnetic cards. A magnetic card stores up to 5000 characters of information and can be used for computer processing or in automatic typing operations.

ASCII CODES

(With Even Parity)

000	Null, tape feed	050	(	
201	Start of heading	251	)	
202	Start of text	252	*	Asterisk
003	End of text	053	+	
204	End of transmission	254	,	Comma
005	Enquiry	055	-	
006	Acknowledge	056	.	Period
207	Bell	257	/	
210	Backspace	060	0	
011	Horizontal tab	261	1	
012	Line Feed or line space	262	2	
213	Vertical tab	063	3	
014	Form feed	264	4	
215	Carriage return	065	5	
216	Shift out	066	6	
017	Shift in	267	7	
220	Data link escape	270	8	
021	Device control 1	071	9	
022	Device control 2	072	:	Colons
223	Device control 3	273	;	Semicolon
024	Device control 4	074	<	
225	Negative acknowledge	275	=	
226	Synchronous idle	276	>	
027	End of transmission block	077	?	
030	Cancel	300	@	
231	End of medium	101	A	
232	Substitute	102	B	
033	Escape	303	C	
234	File separator	104	D	
035	Group separator	305	E	
036	Record separator	306	F	
237	Unit separator	107	G	
240	Space	110	H	
041	!	311	I	
042	"	312	J	
243	#	113	K	
044	\$	314	L	
245	%	115	M	
246	&	116	N	
047	'	317	O	
	Apostrophe			

120	P	350	h
321	Q	151	i
322	R	152	j
123	S	353	k
324	T	154	l
125	U	355	m
126	V	356	n
327	W	157	o
330	X	360	p
131	Y	161	q
132	Z	162	r
333	[	363	s
134	\	164	t
335	]	365	u
336	↑	366	v
137	←	167	w
140		170	x
341	a	371	y
342	b	372	z
143	c	173	{
344	d	374	
145	e	175	}
346	f	176	~
147	g	377	Delete / Rubout
	Accent Mark		



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18 BIT COMPUTER

INSTRUCTION REPERTOIRE

TRANSFER OF CONTROL

JP	0AAAAA	Unconditional Jump
JL	1AAAAA	Jump and Link

A REGISTER OPERATIONS

LA	2AAAAA	Load A
SA	3AAAAA	Store A

D REGISTER OPERATIONS

LD	4DAAAA	Load D
SD	5DAAAA	Store D

INPUT/OUTPUT OPERATION

IO	70XXYY	Input/Output
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CONDITIONAL TRANSFER OF CONTROL

JZ	71AAAA	Jump if D = 0
JN	72AAAA	Jump if D ≠ 0
JA	73AAAA	Jump if A = 0
JF	74AAAA	Jump on Flag
JS	75AAAA	Jump if sign of A = 1
JI	76AAAA	Jump if Interrupt
JH	77AAAA	Jump and Halt

18-Bit ARITHMETIC / LOGICAL OPERATIONS

INC	660AAA	* Increment word
ICC	661AAA	* Increment word if carry = 1
DEC	662AAA	* Decrement word
DCC	663AAA	* Decrement word if carry = 0
RSL	664AAA	* Right shift word, logical
RSC	665AAA	* Right shift word with carry
LSL	666AAA	* Left shift word, logical

18-Bit ARITHMETIC / LOGICAL OPERATIONS (continued)

LSC	667AAA	* Left shift word with carry
ADD	670AAA	Add word
ADC	671AAA	Add word, increment if carry = 1
SUB	672AAA	Subtract word
SBC	673AAA	Subtract word, decrement if carry = 0
EOR	674AAA	Exclusive-Or word
AND	675AAA	And word
OCM	676AAA	* One's complement
TCM	677AAA	* Two's complement

*Memory Modify Operations

3-Bit ARITHMETIC / LOGICAL OPERATIONS

SU	6D0AAA	Subtract Digit
AD	6D1AAA	Add Digit
DE	6D2AAA	Decrement Digit
IN	6D3AAA	Increment Digit
AN	6D4AAA	And Digit
EO	6D5AAA	Exclusive-Or Digit
LS	6D6AAA	Left Shift Digit
RS	6D7AAA	Right Shift Digit

With the 3-Bit Arithmetic Unit an AN operation will set the carry bit to 0, and an EO operation will set the carry bit to 1.

A = Memory Address
D = Digit Address
X = Device Address
Y = Control or Data Bits

PERIPHERAL DEVICE ADDRESSES

01	Teletype Output
02	Teletype Input
03	Line Printer
04	Photoreader
05	Paper Tape Punch
06	Magnetic Tape
07	Disc File
10	Real Time Clock
11	CRT Output
12	CRT Input

TAPE EDITOR COMMANDS

I/O COMMANDS

%E	or (ESC): Enter Line Editing mode
%P	Punch leader, until (ESC) is pushed
%R	Rewind input tape
%T	Top of Form
%U	Unload the input tape

LINE EDITING COMMANDS

\$A	Append text
\$C	Copy until line matches (inclusive)
\$D	Delete until line matches (inclusive)
\$E	Edit next line with character Editing commands
\$F	Finished Line Editing; enter I/O Command mode
\$G	Go; copy a specified number of lines
\$I	Insert a new line
\$R	Remove; delete a specified number of lines
\$S	Strike out; delete the next line
\$T	Take; copy the next line
\$X	X out; delete until line matches (exclusive)
\$Z	Zip; copy until line matches (exclusive)

CHARACTER EDITING COMMANDS

C ^c	Copy until character matches (inclusive)
D ^c	Delete until character matches (inclusive)
F ^c	Finished; editing of characters is done; send line to output and enter Line Editing mode
I ^c	Insert characters into line
K ^c	Kill; delete the preceding character
P ^c	Print the line and reset the Cursor
S ^c	Strike out; delete the next character
T ^c	Take; copy the next character
X ^c	X out; delete until character matches (exclusive)
Z ^c	Zip; copy until character matches (exclusive)
(ESC)	Delete the line being edited and enter Line Editing mode.
(CR)	Same as F ^c except the line is terminated at the current cursor position.

DATA ENTRY SWITCHES

0-4	Down: Produce output listing. Up: Suppress listing
0-2	Down: Produce output tape. Up: Suppress tape
1-4	Down: Produce listing on line printer. Up: Produce listing on Teletype printer.
1-2	Down: Produce listing on high speed punch. Up: Produce listing on Teletype punch.
1-1	Down: Input from high speed reader. Up: Input from Teletype Reader.

DEBUG SYSTEM COMMANDS

#T	Trace All Instructions
L = AAAAA U = AAAAA S = AAAAA D = N A = NNNNNN	Printout will occur when L ≤ instruction address ≤ U
#J	Trace Jump Instructions
L = AAAAA U = AAAAA S = AAAAA D = N A = NNNNNN	Printout will occur when L ≤ instruction address ≤ U
#W	Watch for Write Operation
L = AAAAA U = AAAAA S = AAAAA D = N A = NNNNNN	Printout will occur when L ≤ operand address ≤ U
#D	Dump Contents of Memory
S = AAAAA	
#M	Modify Contents of Memory
@ AAAAA NNNNNN	
#P	Change Limits of Protection
L = AAAAA U = AAAAA	L ≤ Unprotected area ≤ U
#X	Execute Instruction
NNNNN (CR)	

If an "Escape" character is entered, a # will be printed and the DEBUG SYSTEM will wait for another command.

L = Lower address limit
U = Upper address limit
S = Starting address
D = Contents of D Register
A = Contents of A Register

Color Denotes Characters Printed By the Computer